Rec. zool. Surv. India: Vol. 120(3)/211–219, 2020
DOI: 10.26515/rzsi/v120/i3/2020/146821

ISSN (Online) : 2581-8686
ISSN (Print) : 0375-1511

Description of three new species of Aseptate Gregarine, *Monocystis* von Stein, 1848 of Oligochaetes collected from Dhaka, Bangladesh

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Abstract

The paper deals with the description of three new species of *Monocystis* von Stein, 1848 namely *Monocystis bangladeshensis* sp. nov., *Monocystis hamidae* sp. nov. and *Monocystis ribbonae* sp. nov. obtained from the seminal vesicles of earthworm *Metaphire peguana* from Dhaka, Bangladesh. Trophozoites of *Monocystis bangladeshensis* sp. nov. elongated, measure 214.49 x 30.94 µm. Nucleus rounded, measuring 14.28 x 11.4 µm. Gametocysts ovoid, ranging 98.26 x 74.94 µm. Oocysts fusiform, measuring 15.48 x 8.85 µm. Trophozoites of *Monocystis hamidae* sp. nov. irregular in shape, measuring 202.41 µm in length, width of the anterior part and posterior part measure 46.41 x 19.28 µm. Nucleus rounded, measuring 6.0 µm. Gametocysts measure 150.60 µm. Oocysts rhomboid, ranging 8.00 x 5.45 µm. Trophozoites of *Monocystis ribbonae* sp. nov. irregular ribbon-like measuring 88.24 x 16.50 µm. Nucleus spherical, rangining 11.50 x 10.00 µm. Gametocysts ovoid, measure 59.25 x 70.37 µm. Oocysts fusiform, measuring 7.5 x 4.00 µm.

Keywords: *Monocystis bangladeshensis*, *Monocystis hamidae*, *Monocystis ribbonae,* New Species, Taxonomy

Introduction

Gregarines are a group of unicellular endoparasites belonging to the phylum Apicomplexa under the subkingdom Protozoa. Adl *et al.* (2019) proposed that gregarines are recognised as three major groups, archigregarines, eugregarines and neogregarines. Eugregarines (Eugregarinorida Leger, 1900) divided into two groups: septate gregarines and aseptate gregarines. Septate gregarines favoured in arthropods and mollusc and aseptate gregarines tend to harbour in oligochaetes. The aseptate form characterised by undivided body i.e. it doesn't divided by septum. Whereas in the septate form body divided by septum.

Only three species of *Monocystis* namely *M. ayeshae* Sarkar & Bandyopadhyay, 2011; *M. sahadatae* Sarkar & Bandyopadhyay, 2013 and *M. apareshae* Sarkar & Bandyopadhyay, 2014 have so far been established from *Metaphire posthuma* and *Metaphire anomala* respectively collected from Bangladesh.

Ongoing biodiversity survey of aseptate gregarines in earthworms of the Dhaka, Bangladesh revealed three new species of the genus *Monocystis* von Stein, 1848 from the seminal vesicles of the *Metaphire peguana*. In this paper the description, taxonomy and systematics of three new species are presented.

Materials and Methods

Host earthworms were collected by one of the authors (SS), serving the Satkhira College, Satkhira, Bangladesh. The collected earthworms were conserving in a plastic bucket filled with soil and brought into the Parasitology Laboratory, Department of Zoology, University of Kalyani. The seminal vesicles were carefully removed from the dissected earthworms. Seminal vesicles were immersed in 0.62 % NaCl solution. A thin film of seminal fluid has been made on a slide covered with a coverslip. The slides were examined under a phase-contrast (Olympus CX41) microscope. Then the content of the seminal vesicles was semi-dried and fixed in Schaudin's fluid for 20 minutes. The smears were stored in 70% alcohol for removal of mercuric chloride. The slides were then passed through 100%→ 90%→ 70%→ 50% alcohol (5 minutes each) and placed in distilled water. These were kept in 3% iron alum solution (throughout the night) and stained with

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Article Received on: 19.08.2019 Accepted on: 19.05.2020

Heidenhain's hematoxylin solution for 20 minutes. 1% iron alum solution was used for differentiation. The slides were then washed in distilled water and dehydrated in an ascending series of alcohol. They were then cleared in xylene and mounted in Canada balsam as described by Bandyopadhyay *et al.* 2005. The Camera Lucida drawings of the parasites have been done. The photomicrographs have been taken using CX41 Olympus phase-contrast microscope. The shape of the parasites has been described following Clopton (2004).

Results and Discussion

Systematic Account

Phylum APICOMPLEXA Levine, 1988

Class SPOROZOA Leuckart, 1879

Order EUGREGARINORIDA Léger, 1900

Family MONOCYSTIDAE Bütschli, 1882

Subfamily MONOCYSTINAE Bhatia, 1930

Genus ***Monocystis*** von Stein, 1848

Monocystis bangladeshensis sp. nov.

Figure 1(A-C), 2 (A-C); Table 1 and 4

Zoobank: http://Zoobank.org/urn: lsid:zoobank.org:act:50E4818E-3DA2-463A-8ABB-AEC5FF176433

Description: Trophozoites elongated with rounded lobe like an anterior end, bent into downwards forming a question mark like structure. The posterior portion has a short tail-like structure. The nucleus is rounded and present in the middle of the trophozoite. Mucorn situated at the anterior end. Gametocysts are ovoid in shape (Clopton F7) and oocysts are fusiform in shape (Clopton B4).

Gamonts measure 211.45 - 218.79 (214.49 ± 3.77) x 28.73 - 33.15 (30.94 ± 1.88) µm. Nucleus measures 12.5 - 16.3 (14.28 ± 6.4) µm x 10.4 - 12.5 (11.4 ± 3.6) µm. Diameter of gametocysts measuring 94.88 - 105.66 (98.26 ± 3.69) µm x 70.52 - 78.40 (74.94 ± 3.69) µm; Oocysts measure 14.27 - 17.70 (15.48 ± 1.84) µm in length and 6.7 - 11.00 (8.85 ± 1.85) µm in width.

Type material: *Monocystis bangladeshensis* sp.nov.

Type host: *Metaphire peguana* Rosa, 1890

Site of infection: Seminal vesicles

Type locality: Dhaka, Bangladesh

Prevalence: Twelve out of twenty-five host earthworms (48%) were infected with the parasite.

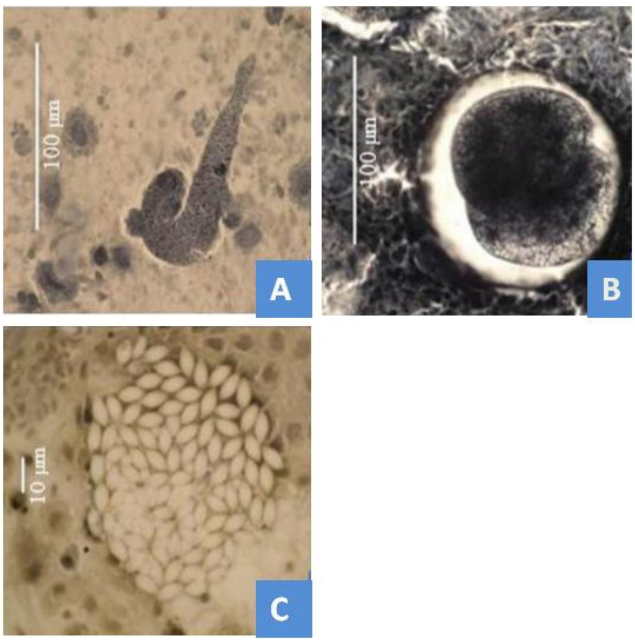

Figure 1. *Monocystis bangladeshensis* sp. nov. (photomicrographs of different stages of the life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

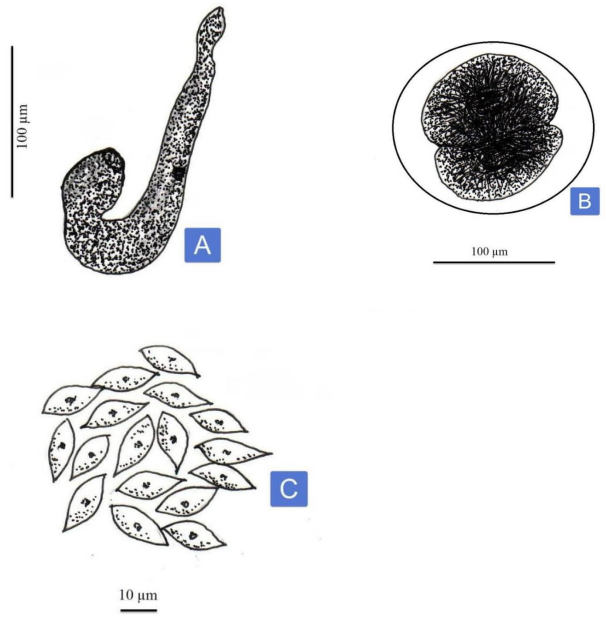

Figure 2. *Monocystis bangladeshensis* sp. nov. (camera lucida drawings of different stages of the life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

Material deposited: Holotype: PR/MC/27/11 is deposited at the Parasitology Laboratory, Department of Zoology, University of Kalyani, Kalyani 741235, West Bengal, India.

Paratype: The paratype has been deposited in the Harold W Manter, Laboratory of Parasitology, Systematic Research Collections, University of Nebraska State Museum, W 436, Nebraska Hall, Lincoln, Nebraska 68588-0514 USA, (Accession no. P-2014-002; Reg. no. HWML 49902).

Etymology: The specific epithet "*bangladeshensis*" has been given after the name of the country, Bangladesh from where the host specimens have been collected.

Table 1. Summary of morphometric data (±µm) of the observed *Monocystis bangladeshensis* sp. nov. stages in seminal vesicles of *Metaphire peguana* (n=20)

Parameters	Range	Mean	Median	SD	SE	CV %
Length of the trophozoite	211.45-218.79	214.49	214.27	3.77	0.84	1.75
Width of the trophozoite	28.73-33.15	30.94	30.54	1.88	0.42	6.07
Length of the nucleus	12.5-16.3	14.28	14.12	6.4	1.43	44.81
Width of the nucleus	10.4-12.5	11.4	11.29	3.6	0.80	31.57
Length of the gametocyst	94.88-105.66	98.26	98.29	3.69	0.82	3.75
Width of the gametocyst	70.52-78.40	74.94	74.69	3.69	0.82	4.92
Length of the oocyst	14.27-17.70	15.48	15.38	1.84	0.41	11.88
Width of the oocyst	6.7-11.00	8.85	8.67	1.85	0.41	20.90

Table 2. Summary of morphometric data (±µm) of the observed *Monocystis hamidae* sp. nov. stages in seminal vesicles of *Metaphire peguana* (n=20)

Parameters	Range	Mean	Median	SD	SE	CV %
Length of the trophozoite	198.9-207.2	202.41	202.36	3.26	0.72	1.61
Width of anterior part of trophozoite	44.20-48.62	46.41	46.31	2.26	0.50	4.86
Width of posterior part of trophozoite	17.68-19.89	19.28	19.34	0.62	0.13	3.21
Diameter of the nucleus	5.5-6.5	6.0	6.08	0.55	0.12	9.16
Diameter of the gametocyst	145.25-160.50	150.60	150.68	6.0	1.34	3.98
Length of the oocyst	8.50-9.25	8.00	8.12	1.25	0.27	15.62
Width of the oocyst	5.25-5.50	5.45	5.35	1.21	0.27	22.20

Table 3. Summary of morphometric data (±µm) of the observed *Monocystis ribbonae* sp. nov. stages in seminal vesicles of *Metaphire peguana* (n=20)

Parameters	Range	Mean	Median	SD	SE	CV%
Length of the trophozoite	86.50 - 90.40	88.24	88.37	10.01	2.23	11.34
Width of the trophozoite	22.00 -25.00	16.50	16.34	8.20	1.83	49.69
Length of the nucleus	14.2 - 16.42	11.50	11.39	3.0	0.67	26.08
Width of the nucleus	9.1 - 11.05	10.00	10.12	1.5	0.33	15
Length of the gametocyst	55.50 - 60.25	59.25	59.19	3.8	0.84	6.41
Width of the gametocyst	67.40 -72.45	70.37	70.30	3.75	0.83	5.32
Length of the oocyst	5.5 - 9.50	7.5	7.3	1.60	0.35	21.33
Width of the oocyst	3.5 - 4.25	4.00	3.89	0.09	0.02	2.25

Remarks: The present form under discussion shows some similarities and dissimilarities with *Monocystis levinei* Bandyopadhyay *et al.*, 2005 and *Monocystis elongatum* Bandyopadhyay *et al.*, 2008. In *M. levinei,* presence of lobe like rounded anterior end while in the present form, an anterior rounded part is forwarded downwards for which parasite looks a peculiar question mark like shape. *M. elongatum* is elongated curved at the anterior end, tapering towards posterior ends with sharply pointed ends. The posterior end of present form also exhibits significant differences with *M. levinei* and *M. elongatum.* The present form has a pointed rectangular tail, shows a reasonable difference from the earlier one. *M. levinei* has a cylindrical pointed tail. In the present form, nucleus presents almost the middle portion of the body while in *M. levinei* nucleus found very close to the tail portion and rounded in shape as like that of *M. elongatum.* Mucron is not found in *M. levinei* but present in the current species as like that of *M. elongatum. M. levinei* and *M. elongatum* were found from Nadia, West Bengal, India and Murshidabad, West Bengal, India respectively, but the new one has been recorded from the host collected from Dhaka, Bangladesh (Table 4).

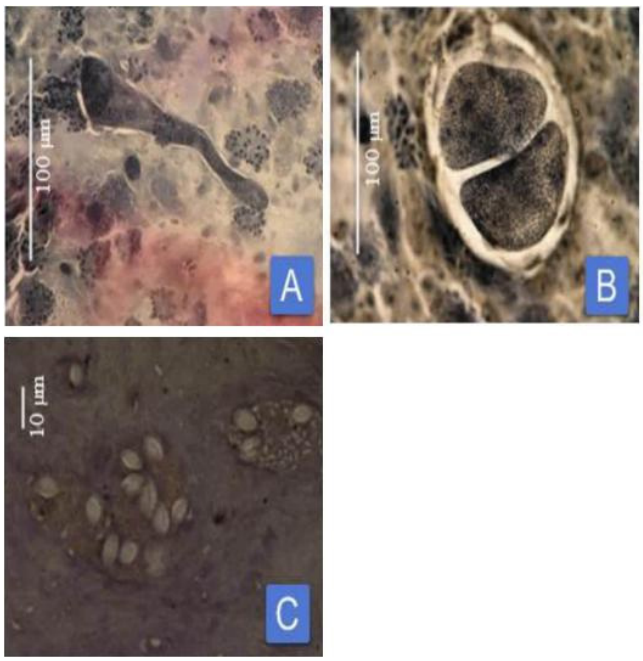

Figure 3. *Monocystis hamidae* sp. nov. (photomicrographs of different stages of the life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

Considering all these aspects, the present species is considered as a new one hence, the name *Monocystis bangladeshensis* sp. nov. is being proposed in this communication.

Monocystis hamidae sp. nov.

Figure 3(A-C), 4(A-C); Table 2 and 5

Zoobank: http://Zoobank.org/urn:lsid:zoobank.org:act:771C0793-E0CB-4EC4-9151-8421B69DEC5E

Description: Trophozoites are irregular in shape. The anterior end contains a broad opening but the posterior part is blunt and bugle like. Nucleus rounded. Gametocysts contain two unequal gametocytes. Large gametocytes are deltoid in shape (Clopton F9). Small gametocytes are obdeltoid in shape (Clopton G10). Oocysts are rhomboid in shape (Clopton C5).

Trophozoites measure 198.9 - 207.2 (202.41 ± 3.26) µm in length, anterior part measures 44.20 - 48.62 (46.41 ± 2.26) µm in width and posterior part measures 17.68 - 19.89 (19.28 ± 0.62) µm in width. The diameter of nucleus measures 5.5 – 6.5 (6.0 ± 0.55) µm. Total gametocyst measures 145.25 – 160.50 (150.60 ± 6.0) µm. Large gametocyte measures 80.90 - 100.50 (90.50 ± 6.00) µm × 55.19 - 95.15 (64.46 ± 12.15) µm. The small gametocyte measures 70.60 - 90.05 (85.50 ± 6.00) µm in length and 60.30 - 72.60 (66.20 ± 5.05) µm in width. Oocysts measure 8.50 - 9.25 (8.00 ± 1.25) µm in length and 5.25 - 5.50 (5.45 ± 1.21) µm in width.

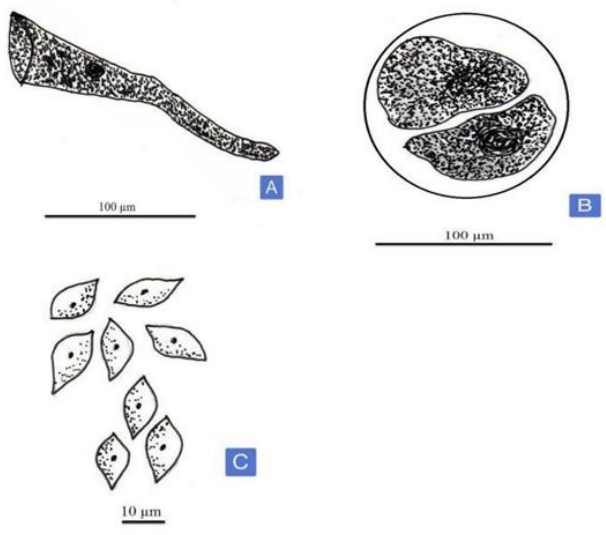

Figure 4. *Monocystis hamidae* sp. nov. (camera lucida drawings of different stages of the life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

Type material: Monocystis hamidae sp. nov.

Type host: Metaphire peguana Rosa, 1980

Site of infection: Seminal vesicles

Type locality: Dhaka, Bangladesh

Prevalence: Ten out of thirty-seven host earthworms (27.02%) were infected with the parasite.

Material deposited: Holotype: PR/MC/29/11 is deposited at the Parasitology Laboratory, Department of Zoology, University of Kalyani, Kalyani 741235, West Bengal, India.

Paratype: The paratype has been deposited in the Harold W Manter, Laboratory of Parasitology, Systematic Research Collections, University of Nebraska State Museum, W 436, Nebraska Hall, Lincoln, Nebraska 68588-0514 USA, (Accession no. P-2014-002; Reg. no. HWML 49902).

Etymology: The specific epithet "*hamidae*" has been given after the name of Prof. Hamida Khanam, Professor of Zoology (Retd.), University of Dhaka, Bangladesh for her outstanding contribution in the field of Parasitology.

Remarks: While comparing the present species with *Monocystis bengalensis* Ghosh, 1923 and *Monocystis levinei* Bandyopadhyay *et al.* 2005, it appears that *M. levinei* has lobe like anterior end. In present form, the anterior portion with broad opening which gives a mouth like shape while, in *M. bengalensis* gamont is oval shaped in young stage, elongated or club shaped in mature stage, contains rounded anterior end. In addition to the anterior end, the posterior end of the present form exhibits prominent differences with *M. levinei* and *M. bengalensis*. The present form has a lobe like cylindrical tail which shows a significant difference from the previously described species as it bears pointed tail. Moreover, the shape and size of nucleus, gametocyst and oocyst of the current species are different from the previously recorded species. Furthermore, the present form has been recorded from *Metaphire peguana* of Dhaka, Bangladesh, while *M. levinei* and *M. bengalensis* have been recorded from *Eutyphoeus incommodus* of Nadia, West Bengal, India and *Pheretima posthuma* of Calcutta, West Bengal, India respectively (Table 5).

Based on the comparative characters of the present form with the previously described species, the species under discussion seems to be a new one hence the name *Monocystis hamidae* sp. nov. is being proposed.

Monocystis ribbonae sp. nov.

Figure 5(A-C), 6 (A-C); Table 3 and 6

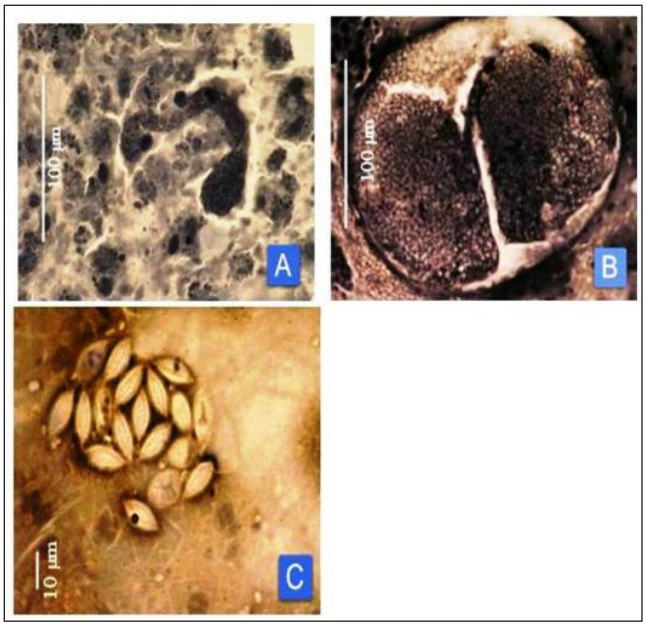

Figure 5. *Monocystis ribbonae* sp. nov. (photomicrographs of different stages of the life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

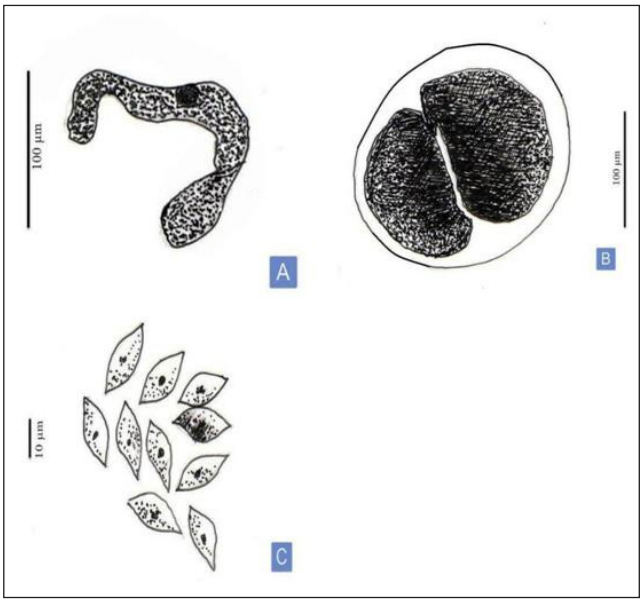

Figure 6. *Monocystis ribbonae* sp. nov. (camera lucida drawings of different stages of life cycle) A. Trophozoite; B. Gametocyst; C. Oocyst. Scale-bars. A-B, 100 µm; C, 10 µm.

Zoobank: http://Zoobank.org/urn:lsid:zoobank.org:act:043C8E0E-A3F8-4956-BCE1-E8AACBD32A2F

Description: In present form trophozoite irregular, ribbon-like contains two lobes. One lobe is more spherical and rounded than the other lobe. Nucleus spherical, situated at the middle of the body. Presence of highly granulated endoplasm contains paraglycogen granules. Gametocyst ovoid in shape (Clopton G7). Oocyst are fusiform in shape (Clopton B4).

Trophozoites measure 86.50 - 90.40 (88.24 ± 10.01) µm × 22.00 - 25.00(16.50 ± 8.20) µm. Nucleus measures 14.2 - 16.42 (11.50 ± 3.0) µm × 9.1 - 11.05 (10.00 ± 1.5) µm. Gametocysts measure 55.50 - 60.25 µm (59.25 ± 3.8) µm × 67.40 - 72.45 (70.37 ± 3.75) µm. Oocysts measuring 5.5 - 9.50 (7.5 ± 1.60) µm × 3.5 - 4.25 (4.00 ± 0.09) µm.

Type material: Monocystis ribbonae sp. nov.

Site of infection: Seminal vesicles

Type Host: Metaphire peguana Rosa, 1980

Type locality: Dhaka, Bangladesh

Prevalence: Fourteen out of forty host earthworms (35%) were infected with the parasite.

Material deposited:

Holotype: PR/MC/30/11 has been deposited at the Parasitology Laboratory, Department of Zoology, University of Kalyani, Kalyani 741235, West Bengal, India.

Paratype: The paratype has been deposited in the Harold W Manter, Laboratory of Parasitology, Systematic Research Collections, University of Nebraska State Museum,

Table 4. Morphometric comparison of *Monocystis bangladeshensis* sp. nov. with earlier described closely related species

Species characters	*M. elongatum* Bandyopadhyay *et al.* 2008	*M. levinei* Bandyopadhyay *et al.* 2005	*M. bangladeshensis* sp. nov. (Present study)
Host	*Perionyx excavatus* Perrier, 1872	*Eutyphoeus incommodus* Beddard, 1901	*Metaphire peguana* Rosa, 1890
Locality	Murshidabad, West Bengal, India	Nadia, West Bengal, India	Dhaka, Bangladesh
Site of infection	Seminal vesicles	Seminal vesicles	Seminal vesicles
Trophozoite	Elongated, curved at the anterior end, tapering towards the posterior end with sharply pointed ends, measures 265.0-346.0 (310.0 ± 2.6) x 46.0-64.3 (52.0 ± 3.1) µm.	Elongated, contains prominent tail like protrusion at the posterior end, measuring 145.0 - 175.0 (163.0 ± 1.5) µm x 18.0 - 43.0 (29.0 ± 1.1) µm	Elongated and rounded lobe like anterior end bent into downwards. Posterior end with a short tail like structure. It measures 211.45 - 218.79 (214.49 ± 3.77) x 28.73 -33.15 (30.94 ± 1.88) µm.
Ectoplasm	Smooth	Smooth	Thin and smooth
Endoplasm	Highly granular and vacuolated with a large number of paraglycogen granules	Paraglycogen granules are not prominent	Endosarc contains granular inclusions
Mucron	Distinct, at the anterior end of the body	Mucorn absent	Mucorn situated at the anterior end. It measures 11.05 - 19.89 (15.47 ± 3.76) µm × 13.26 - 17.68 (15.47 ± 1.88) µm
Nucleus	Rounded to ovoid nucleus, measures 12.3-20.5 (19.4 ± 1.7) x 11.4-18.7 (16.3 ± 1.8) µm	Rounded. It measures 14.2 - 26.3 (22.3 ± 7.3) µm x 18.4 - 30.5 (26.4 ± 2.6) µm	Rounded, present at the middle of the trophozoite, measuring 12.5 – 16.3 (14.28 ± 6.4) x 10.4 – 12.5 (11.4 ± 3.6) µm.
Gametocyst	Ovoid with two equal gametocytes, measures 74.0 - 98.3 (82.0 ± 1.9) x 56.0 - 82.0 (72.5 ± 2.7) µm	Ovoid and measures 130 – 163 (152.0 ± 0.4) µm	Ovoid. It measures 94.88 - 105.66 (98.26 ± 3.69) µm × 70.52 - 78.40 (74.94 ± 3.69) µm
Oocyst	Biconical, measuring 9.7-15.3 (12.3 ± 3.1) x 6.8-10.3 (9.4 ± 1.1) µm	Navicular, measuring 8.9 - 12.0 (10.4 ± 1.0) µm x 5.2 - 7.3 (6.9 ± 0.5) µm	Fusiform in shape, measures 14.27 - 17.70 (15.48 ± 1.84) µm × 6.7 -11.00 (8.85 ± 1.85) µm

Table 5. Morphometric comparison of *Monocystis hamidae* sp. nov. with *Monocystis bengalensis* and *Monocystis levinei*

Species characters	*M. bengalensis* Ghosh, 1923	*M. levinei* Bandyopadhyay *et al.* 2005	*M. hamidae* sp. nov. (Present study)
Host	*Pheretima posthuma* Vaillant, 1868	*Eutyphoeus incommodus* Beddard, 1901	*Metaphire peguana* Rosa, 1890
Locality	Calcutta, West Bengal, India	Nadia, West Bengal, India	Dhaka, Bangladesh
Site of infection	Seminal vesicles	Seminal vesicles	Seminal vesicles
Trophozoite	Oval shaped in young stage, elongated or club shaped in mature stage. Rounded anterior end is wider than pointed posterior end, measuring 40 – 80 µm x 12-30 µm.	Elongated with a prominent tail like protrusion at the posterior end. It measures 145.0 –175.0 (163.0 ± 1.5) µm x 18.0 – 43.0 (29.0 ± 1.1) µm.	Irregular in shape. Anterior part contains broad opening but the posterior end is bugle like tubular and blunt. Trophozoite length is 198.9 - 207.2 (202.41 ± 3.26) µm, width of the anterior part 44.20–48.62 (46.41 ± 2.26) µm and width of the posterior 17.68 – 19.89 (19.28 ± 0.62) µm.
Ectoplasm	Smooth	Smooth	Thin and smooth
Endoplasm	Highly granular contains large irregular shaped paramylon grains	Paraglycogen granules are not prominent	Not granulated
Nucleus	Rounded , contains large irregular karyosome with several compact masses	Rounded. It measures 14.2 - 26.3 (22.3 ± 7.3) µm x 18.4 -30.5 (26.4 ± 2.6) µm	Rounded. It measures 5.5 - 6.5 (6.0 ± 0.55) µm in diameter
Gametocyst	Rounded or oval shaped, range from 70-80µm	Ovoid amd measuring 130 - 163 (152.0 ± 0.4) µm	It contains two unequal gametocytes. Large gametocyte deltoid in shape and small gametocyte obdeltoid in shape. Total Gametocyst measuring 145.25 -160.50 (150.60 ± 6.00) µm in diameter
Oocyst	Not stated	Navicular, measuring 8.9 – 12.0 (10.4 ± 1.0) µm x 5.2 – 7.3 (6.9 ± 0.5) µm	Rhomboid, measuring 8.50 - 9.25 (8.00 ± 1.25) µm x 5.25–5.50 (5.45 ± 1.21) µm.

W 436, Nebraska Hall, Lincoln, Nebraska 68588-0514 USA, (Accession no. P-2014-002; Reg. no. HWML 49902).

Etymology: The specific epithet "*ribbonae*" has been given after the shape of the parasite under discussion.

Remarks: The present species under discussion shows some resemblance with *Monocystis bengalensis* Ghosh, 1923 and *Monocystis sahadatae* Sarkar and Bandyopadhyay, 2013. The present form has flat shaped trophozoites contain curved body giving a ribbon-like shape to the trophozoite while it is solitary, irregular in shape, anterior end is rounded and posterior end is cylindrical, blunt in *M. sahadatae* and it is oval shaped in young stage and elongated or club shaped in mature stage and rounded anterior end is wider than pointed posterior end in *M. bengalensis*. Nucleus spherical in present form but it rounded in earlier recorded species. Moreover, shape and size of gametocyst and oocyst of the current species are different from the previously recorded species. In addition, *M. bengalensis* has been recorded from *Pheretima posthuma* of Calcutta, West Bengal, India and *M. sahadatae* has been recorded from *Metaphire posthuma* of Narayanganj, Bangladesh, while the present form has been described from *Metaphire peguana* of Dhaka, Bangladesh (Table 6).

Table 6. Morphometric comparison of *Monocystis ribbonae* sp. nov. with *Monocystis bengalensis* and *Monocystis sahadatae*

Species characters	*M. bengalensis* Ghosh, 1923	*M. sahadatae* Sarkar and Bandyopadhyay 2013	*M. ribbonae* sp. nov. (Present study)
Host	*Pheretima posthuma* Vaillant, 1868	*Metaphire posthuma* Vaillant, 1869	*Metaphire peguana* Rosa, 1890
Locality	Calcutta, West Bengal, India	Narayanganj, Bangladesh.	Dhaka, Bangladesh
Site of infection	Seminal vesicles	Seminal vesicles	Seminal vesicles
Trophozoite	Oval shaped in young stage, elongated or club shaped in mature stage. Rounded anterior end is wider than pointed posterior end, measuring 40 – 80 µm x 12-30 µm.	Solitary, irregular in shape, anterior end is rounded and posterior end cylindrical, blunt. measuring 338 -348.4(343.2 ± 4.39) µm in length	Irregular ribbon like with two lobes and measures 86.50 - 90.40 (88.24 ± 10.01) µm x 22.00 - 25.00(16.50 ± 8.20) µm
Ectoplasm	Smooth	Smooth	Thin and smooth
Endoplasm	Highly granular contains large irregular shaped paramylon grains	Dense with paraglycogen granules	Highly granulated contains parglycogen granules
Nucleus	Rounded, contains large irregular karyosome with several compact masses	Rounded, measuring 10.22 -12.27 (11.04 ± 1.03) µm.	Nucleus spherical, measuring 14.2 – 16.42 (11.50 ± 3.0) µm x 9.1 -11.05 (10.00 ± 1.5) µm
Gametocyst	Rounded or oval shaped, range from 70-80µm	Oval shaped contains two unequal gametocytes, measuring 98.8 - 109 (103.93 ± 4.31) × 78 - 88.4 (83.13 ± 4.39) µm.	Ovoid. It measures 55.50 -60.25 (59.25 ± 3.8) µm x 67.40 - 72.45 (70.37 ± 3.75) µm
Oocyst	Not stated	Bioconical, measuring 31.2 -41.6 (36.4 ± 4.39) × 20.8 - 31.2 (26 ± 4.31) µm	Fusiform, It measures 5.5 - 9.50 (7.5 ± 1.60) µm x 3.5 -4.25 (4.00 ± 0.09) µm

Considering all these aspects the species under discussion seems to be a new one. Hence the name *Monocystis ribbonae* sp. nov. is being proposed in this communication.

Acknowledgements

Authors (SS and BK) are thankful to the authorities of the University of Kalyani, Kalyani, West Bengal, India for extending permission to work at the Parasitology Laboratory of the Department of Zoology. One of the authors (BK) is thankful to the University of Kalyani, Kalyani, West Bengal, India for providing research fellowship to carry out the research work. Thanks are also due to Dr. C. K. Mandal of ZSI, Kolkata for identification of the host specimen.

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